

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-311679

(43)Date of publication of application : 04.11.1994

(51)Int.Cl.

H02K 1/27
H02K 21/14

(21)Application number : 05-096084

(71)Applicant : FANUC LTD

(22)Date of filing : 22.04.1993

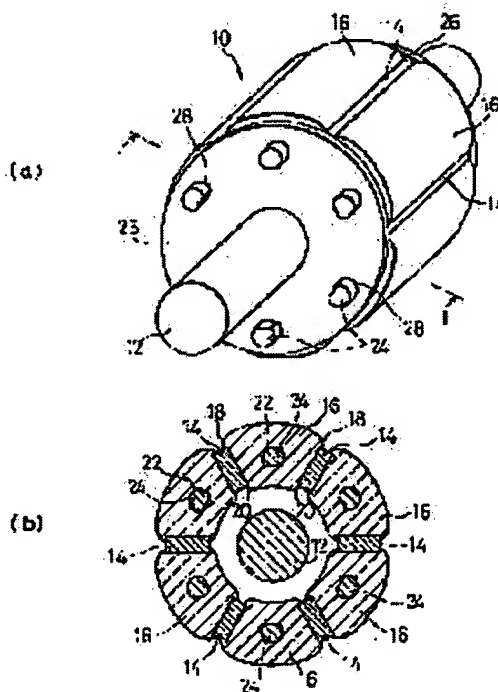
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(54) ROTOR OF SYNCHRONOUS MOTOR

(57)Abstract:

PURPOSE: To prevent a plurality of core members from being turned and shifted in a rotor, for a synchronous motor, which is formed in such a way that a plurality of permanent magnets and the plurality of core members are arranged and installed alternately at the circumference of a shaft.

CONSTITUTION: A rotor 10 is provided with six permanent magnets 14 which are arranged at nearly equal intervals at the circumference of a shaft 12 and with six core members 16 which are arranged and installed between the individual permanent magnets 14 and by which magnetic poles are formed respectively. A through hole 22 which is passed and formed rectilinearly in the axial direction is provided nearly in the center of each core member 16. The through hole 22 is provided with a bow-shaped cross section formed by cutting off a part of a circle in a face at right angles to the shaft. A rod member 24 provided with a bow-shaped cross section which is nearly the same as the cross-sectional shape of each through hole 22 is inserted into, and passed through, each through hole. The rod member 24 protrudes from both edges in the axial direction of each core member 16, and it is fixed to end plates 26 which have been arranged so as to be brought into close contact at both ends in the axial direction of the permanent magnets 14 and the core members 16. The individual end plates 26 are fixed to the shaft 12.



LEGAL STATUS

[Date of request for examination] 21.04.2000

[Date of sending the examiner's decision of rejection] 05.02.2002

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[Kind of final disposal of application other than the
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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of
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CLAIMS

[Claim(s)]

[Claim 1] Two or more permanent magnets which are arranged around a revolving shaft at abbreviation regular intervals, and are magnetized to a hoop direction, Two or more core members in which each of this permanent magnet is pinched to a hoop direction, it is arranged in the perimeter of this revolving shaft, and each forms a magnetic pole, In Rota of the synchronous motor possessing two or more rod members which are arranged to the shaft-orientations ends of this permanent magnet and this core member, penetrate the end plate of the couple fixed to this revolving shaft, and each of this core member to shaft orientations, and are fixed to this end plate at both ends In the field where a shaft and said rod member cross at right angles, it has a noncircular section. Said core member Rota of the synchronous motor characterized by having the breakthrough which has the cross-section configuration of this rod member, and the noncircular section of abbreviation identitas in the field which intersects perpendicularly with a shaft, and is prolonged to shaft orientations, and inserting this rod member in this breakthrough.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to Rota of a synchronous motor.

[0002]

[Description of the Prior Art] In the synchronous motor of a permanent magnet field, Rota which comes by turns to arrange in the perimeter of a revolving shaft two or more core members in which each forms a magnetic pole between two or more permanent magnets magnetized to a hoop direction and these permanent magnets is known. In this conventional kind of Rota, generally, close pinching of each permanent magnet is carried out on the side face of each core member which adjoins on that side face, and positioning and fixed support are carried out by the outside stop section and the inside stop section which protruded on the side face in the radial periphery section and the inner circumference section of each core member radial. On the other hand, each core member equips an abbreviation core with the breakthrough prolonged to shaft orientations, and a rod member is inserted in each breakthrough. In the shaft-orientations ends side of a permanent magnet and a core member, close arrangement of the disc-like end plate is carried out, respectively, and each end plate is fixed to a revolving shaft. Opening is prepared in the location adjusted in each end plate at the breakthrough of each core member, and the both ends of the rod member which projects slightly from the shaft-orientations ends side of a core member penetrate opening of each end plate, and are fixed to each end plate. Thus, two or more permanent magnet and two or more core members are supported fixed within the Rota structure to external force, such as a centrifugal force.

[0003]

[Problem(s) to be Solved by the Invention] In above-mentioned Rota, positioning and support of a permanent magnet and a core member are gained by immobilization with the rod member and end plate which penetrate a core member, and immobilization with an end plate and a revolving shaft. However, generally, if a minute clearance is formed between the side face of a permanent magnet, the side face of a core member, the outside stop section, and the inside stop section of the dimension error at the time of shaping of a permanent magnet and a core member, since it consists of the round bar with which a rod member has a circular cross section, a core member rotates focusing on a rod member, and exact positioning may not be obtained [that positive support of a permanent magnet is no longer gained, and] according to it. In order to reduce the cogging torque of a motor, such nonconformity especially superposes core **** which comes to combine a permanent magnet and a core member with predetermined arrangement to shaft orientations, and becomes remarkable in Rota which has the skew structure which only the predetermined include angle rotated each core **** relatively, and was fixed. In Rota of skew structure, generally, since the breakthrough of a rod member shifts from the core of a core member and is formed, a couple arises by the gap with the supporting point of a core member, and a center of gravity.

[0004] The above-mentioned nonconformity can be prevented to some extent by making Rota carry out impregnation of the impregnant after the assembly of Rota, and filling a minute clearance. However, by this approach, revolution deviation of the core member in front of the impregnation process in assembled Rota cannot be prevented. Moreover, when impregnation is inadequate, a core member may rotate according to external force exerted on a core member to the method of the outside of radial at the time of magnetization of a permanent magnet, and the actuation after motor inclusion, such as magnetic-attraction force and a centrifugal force. Thus, when a core member produces revolution deviation, the opening distance between stators changes and there is a fear of having an adverse effect on the actuation precision of a motor.

[0005] In Rota of the synchronous motor which comes to arrange two or more permanent magnets and two or more core members in the perimeter of a revolving shaft to a hoop direction by turns, the object of this invention can fix and

position a permanent magnet and a core member certainly, without requiring a strict shaping precision, and is to offer Rota which can improve the engine performance and dependability of a motor.

[0006]

[Means for Solving the Problem] Two or more permanent magnets which this invention is arranged around a revolving shaft at abbreviation regular intervals, and are magnetized to a hoop direction in order to attain the above-mentioned object, Two or more core members in which each of a permanent magnet is pinched to a hoop direction, it is arranged in the perimeter of a revolving shaft, and each forms a magnetic pole, In Rota of the synchronous motor possessing two or more rod members which are arranged to the shaft-orientations ends of a permanent magnet and a core member, penetrate the end plate of the couple fixed to a revolving shaft, and each of a core member to shaft orientations, and are fixed to an end plate at both ends In the field where a shaft and a rod member cross at right angles, it has a noncircular section. A core member It has the breakthrough which has the cross-section configuration of a rod member, and the noncircular section of abbreviation identitas in the field which intersects perpendicularly with a shaft, and is prolonged to shaft orientations, and Rota of the synchronous motor characterized by inserting a rod member in this breakthrough is offered.

[0007]

[Function] Relative revolution actuation of the core member centering on a rod member is prevented by the mutual engagement to the breakthrough which has a noncircular section in the field which intersects perpendicularly with a shaft, and a rod member. Therefore, when an end plate carries out fixed support of the rod member, a core member is mechanically stopped to revolution deviation in Rota. Even when a clearance is between the adjoining permanent magnets and core members by that cause, it stops arising and the revolution of the core member centering on a rod member can hold a permanent magnet and a core member in a predetermined location.

[0008]

[Example] Hereafter, based on the suitable example shown in the accompanying drawing, this invention is further explained to a detail. When a drawing is referred to, drawing 1 shows Rota 10 of the synchronous motor by the 1st example of this invention. Rota 10 is arranged around a revolving shaft 12 and a revolving shaft 12 at abbreviation regular intervals, it pinches each of the permanent magnet 14 of plurality (drawing six pieces) magnetized in alternation to a hoop direction, and a permanent magnet 14 to a hoop direction, is arranged in the perimeter of a revolving shaft 12, and is equipped with the core member 16 of plurality (drawing six pieces) in which each forms a magnetic pole. A permanent magnet 14 has an abbreviation rectangular parallelepiped configuration, and close pinching is carried out on the side face of each of that core member 16 that adjoins in respect of the pair opposite side. The outside stop section 18 which projects to a hoop direction in the periphery section, and the inside stop section 20 which projects to a hoop direction in the inner circumference section are formed in the both-sides side of the core member 16. Therefore, each permanent magnet 14 is positioned by the outside stop section 18 and the inside stop section 20 of the core member 16 radial, and resists a centrifugal force and the magnetic-attraction force, and is stopped.

[0009] Each core member 16 equips the shape of a straight line with the breakthrough 22 by which penetration formation was carried out in the shaft orientations of an axis, i.e., the direction of a revolving shaft 12, in the abbreviation core. A breakthrough 22 has the ogival section which comes to excise a part of circle in the field which intersects perpendicularly with the axis of a revolving shaft 12, as shown in drawing 1 (b). The rod member 24 which has the ogival section of the cross-section configuration and abbreviation identitas in the field which intersects perpendicularly with an axis is inserted in each breakthrough 22. The rod member 24 has the die length which projects slightly from the shaft-orientations ends side of the core member 16. In the shaft-orientations ends side of a permanent magnet 14 and the core member 16, close arrangement of the disc-like end plate 26 of a couple is carried out. The opening 28 which has the cross-section configuration of a breakthrough 22 and the ogival section of abbreviation identitas in the field which intersects perpendicularly with the axis of a revolving shaft 12 in the location adjusted in the breakthrough 22 of the core member 16 is formed in each end plate 26. At the ends which project from the shaft-orientations ends side of the core member 16, each rod member 24 penetrates the opening 28 of each end plate 26, and is fixed to each end plate 26 by the fixed means which is not illustrated. Each end plate 26 is fixed to a revolving shaft 12 by eye a thermal insert, adhesion, etc.

[0010] In order that the core member 16 which forms the magnetic pole of Rota 10 may control iron loss, a laminating and being formed mutually unitedly are desirable in the sheet metal core piece of a large number which consist of magnetic materials, such as silicon steel. At this time, generally, since a sheet metal core piece is pierced from a magnetic sheet metal ingredient and formed of processing, it can also form the breakthrough 22 of the above non-round shapes easily.

[0011] Thus, in Rota 10, since the cross-section configuration of a breakthrough 22 and the rod member 24 was made into the segment of a non-round shape, in any cases, rotation of the core member 16 centering on the rod member 24 is prevented by fixing the rod member 24 to an end plate 26. Therefore, even when a clearance is formed of the dimension error at the time of shaping between the outside stop section 18 of a permanent magnet 14 and the core member 16, and the inside stop section 20 at the time of the assembly of Rota 10, it is not concerned with the existence of an impregnant but fixed support of the core member 16 is carried out by it in a predetermined location.

Consequently, even if external force, such as magnetic-attraction force and a centrifugal force, is added at the time of magnetization of a permanent magnet 14, and the actuation after motor inclusion, the revolution deviation of the core member 16 is not produced. In addition, positioning and fixed maintenance of a permanent magnet 14 are secured by performing impregnation processing to the above-mentioned structure as usual.

[0012] Drawing 2 shows Rota 30 by the 2nd example of this invention. Rota 30 has the skew structure on which it rotated relatively and only the predetermined include angle superposed two core **** 36 which come to combine two or more permanent magnets 32 and two or more core members 34 with predetermined mutual arrangement to shaft orientations. The breakthrough 38 prepared in each core member 34 of core **** 36 has a core on the radius line which deviated only the include angle alpha from the radial center line in the same direction, as shown in drawing 2 (b). The skew structure of drawing 2 (a) is acquired by the deviation direction of an include angle alpha superposing on shaft orientations in the condition that, as for the configuration of drawing 2 (b), and drawing 2 (b), the condition which turned two core **** 36 over mutually, i.e., the end-face configuration where it saw from the same, presents the configuration of hard flow here, and inserting the common rod member 40 in the breakthrough 38 of the core member 34 of both core **** 36. In order to assist support of the rod member 40 which tends to become a long picture, the disk member 42 equipped with opening (not shown) which inserts in the rod member 40 is made to intervene between both core **** 36. Moreover, close arrangement of the end plate 44 of the thing in Rota 10 of drawing 1 and an abbreviation same configuration is carried out at the shaft-orientations outside end face of both core **** 36, respectively. The cross-section configuration of a breakthrough 38, the rod member 40, and the opening 46 of an end plate 44 is a segment like the example of drawing 1 in the field which intersects perpendicularly with the axis of a revolving shaft 12. Although the core member 34 is the configuration which is easy to wear a couple as mentioned above according to Rota 30, the revolution of the core member 34 centering on the rod member 40 is prevented by mutual engagement of the breakthrough 38 which has a noncircular section, the rod member 40, and opening 46.

[0013] Drawing 3 shows Rota 48 by the 3rd example of this invention. Rota 48 has the same skew structure as Rota 30 of drawing 2. The breakthrough 54 which has a forward hexagon cross section in the field which intersects perpendicularly with the axis of a revolving shaft 12 in the location which deviated only the predetermined include angle beta from the core like the breakthrough 38 in Rota 30 is formed in the core member 52 of one core **** 50 of Rota 48. The rod member 60 to which the opening 58 which has the hexagon cross section of the cross-section configuration of a breakthrough 54 and abbreviation identitas has the hexagon cross section of those cross-section configurations and abbreviation identitas in those breakthroughs 54 and openings 58 by adjustment arrangement is inserted also in the end plate 56 of a couple. Also in Rota 48, the revolution of the core member 52 centering on the rod member 60 is prevented by fixing the rod member 60 to the opening 58 of an end plate 56.

[0014] It cannot be overemphasized that this invention can offer the various modifications other than each above-mentioned example. Especially the breakthrough of a core member and the cross-section configuration of a rod member are not limited to the configuration of the above-mentioned example, and various configurations except circular are possible for them. However, it is advantageous to use the rectangular-head rod marketed under JIS and hexagonal bars as a rod member from a viewpoint of ingredient cost. Moreover, opening of an end plate may not have the cross-section configuration and abbreviation same cross section of a breakthrough like the above-mentioned example, and a rod member, and may not have the opening itself further. In that case, it is what has only to be able to fix a rod member to an end plate with a well-known fixed means.

[0015]

[Effect of the Invention] Since this invention made un-circular each of cross-section configurations of a rod member, and cross-section configurations of the breakthrough of the core member which inserts in a rod member, in any cases, the relative revolution of the core member centering on a rod member is prevented so that clearly from the above explanation. Consequently, a strict shaping precision of a permanent magnet and a core member is not required, but when ** also fixes a rod member to an end plate, a permanent magnet and a core member can be positioned to accuracy in Rota, and external force, such as magnetic-attraction force and a centrifugal force, is resisted, and it can hold certainly in a predetermined location. Therefore, the engine performance and actuation dependability of a motor can be improved by using Rota of this invention.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] the sectional view which met the (a) perspective view and (b) line I-I in drawing of Rota by the 1st example of this invention -- it comes out.

[Drawing 2] the sectional view which met the (a) perspective view and (b) line II-II in drawing of Rota by the 2nd example of this invention -- it comes out.

[Drawing 3] drawing of Rota by the 3rd example of this invention -- the (a) perspective view and (b) line the sectional view in alignment with III-III -- it comes out.

[Description of Notations]

- 12 -- Revolving shaft
- 14 32 -- Permanent magnet
- 16, 34, 52 -- Core member
- 18 -- Outside stop section
- 20 -- Inside stop section
- 22, 38, 54 -- Breakthrough
- 24, 40, 60 -- Rod member
- 26, 44, 56 -- End plate
- 28, 46, 58 -- Opening

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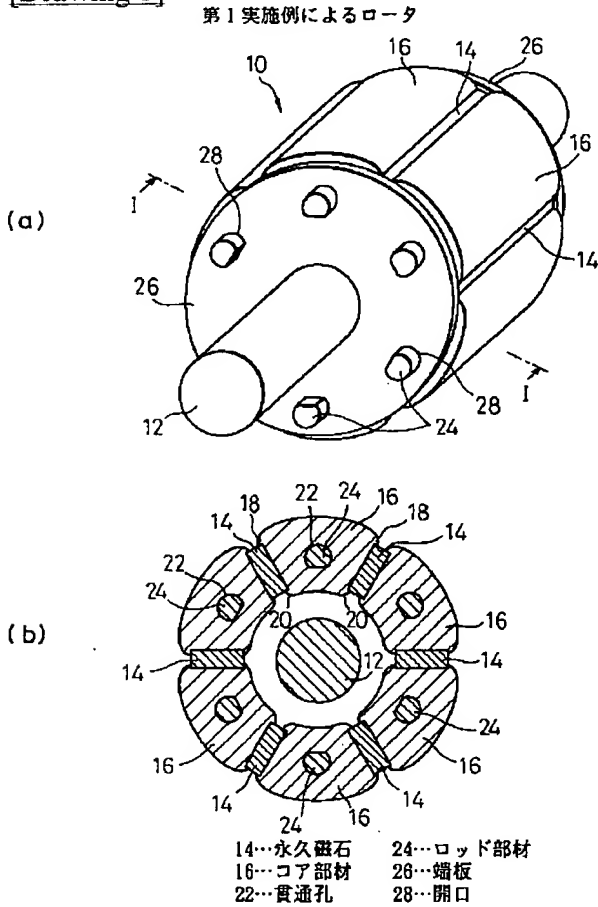
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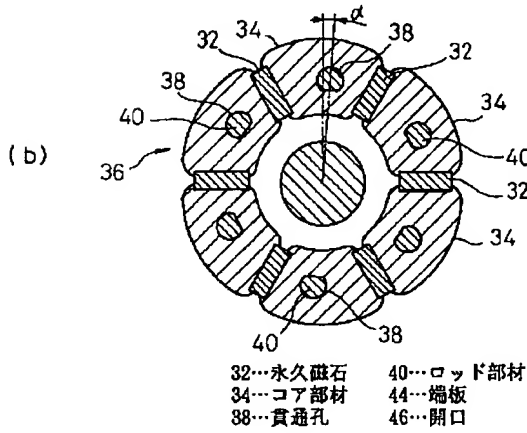
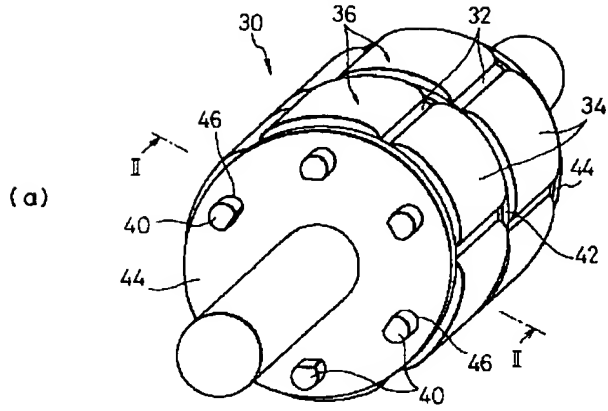
DRAWINGS

[Drawing 1]



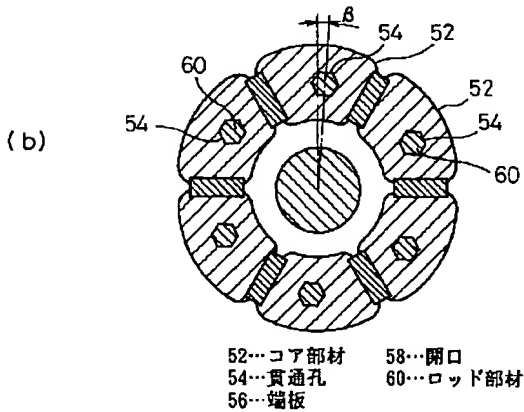
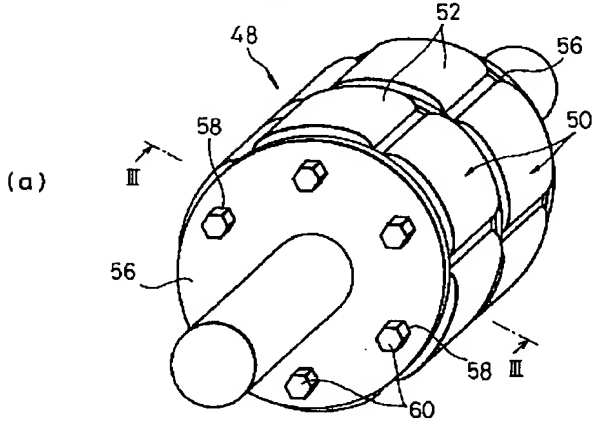
[Drawing 2]

第2実施例によるロータ



[Drawing 3]

第3実施例によるロータ



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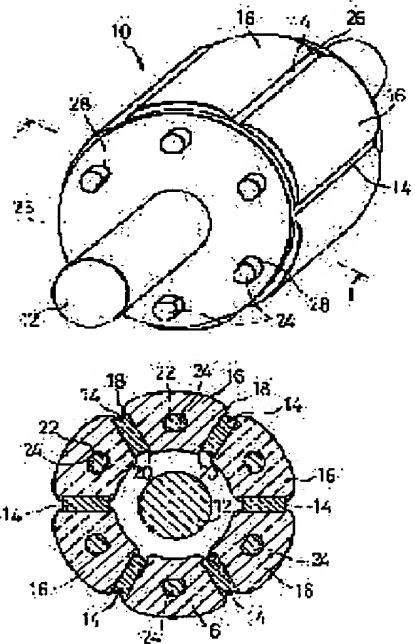
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(54) ROTOR OF SYNCHRONOUS MOTOR

(57)Abstract:

PURPOSE: To prevent a plurality of core members from being turned and shifted in a rotor, for a synchronous motor, which is formed in such a way that a plurality of permanent magnets and the plurality of core members are arranged and installed alternately at the circumference of a shaft.

CONSTITUTION: A rotor 10 is provided with six permanent magnets 14 which are arranged at nearly equal intervals at the circumference of a shaft 12 and with six core members 16 which are arranged and installed between the individual permanent magnets 14 and by which magnetic poles are formed respectively. A through hole 22 which is passed and formed rectilinearly in the axial direction is provided nearly in the center of each core member 16. The through hole 22 is provided with a bow-shaped cross section formed by cutting off a part of a circle in a face at right angles to the shaft. A rod member 24 provided with a bow-shaped cross section which is nearly the same as the cross-sectional shape of each through hole 22 is inserted into, and passed through, each through hole. The rod member 24 protrudes from both edges in the axial direction of each core member 16, and it is fixed to end plates 26 which have been arranged so as to be brought into close contact at both ends in the axial direction of the permanent magnets 14 and the core members 16. The individual end plates 26 are fixed to the shaft 12.



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(19)日本国特許庁(JP)

(12)公開特許公報 (A)

(11)特許出願公開番号

特開平6-311679

(43)公開日 平成6年(1994)11月4日

(51)Int. Cl.⁵

H02K 1/27
21/14

識別記号

501 C
M

庁内整理番号

7103-5H
7103-5H

F I

技術表示箇所

審査請求 未請求 請求項の数1

O L

(全5頁)

(21)出願番号 特願平5-96084

(22)出願日 平成5年(1993)4月22日

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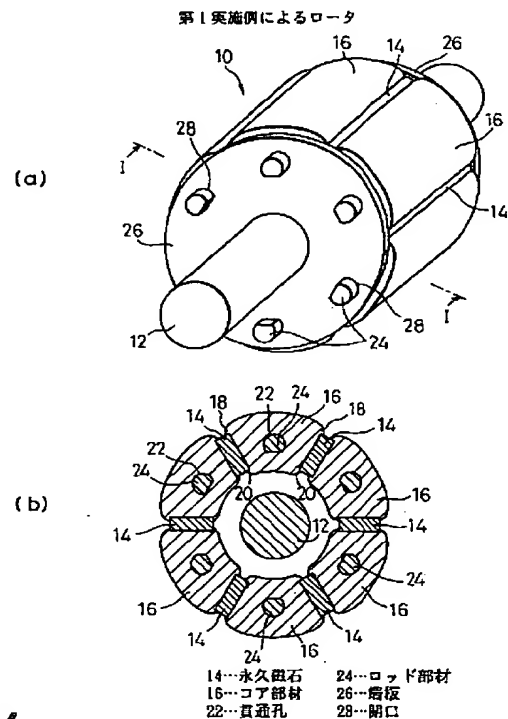
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(54)【発明の名称】同期電動機のロータ

(57)【要約】

【目的】 回転軸の周囲に複数の永久磁石と複数のコア部材とを周方向へ交互に配設してなる同期電動機のロータの、コア部材の回転偏移を防止する。

【構成】 ロータ10は、回転軸12の周囲に略等間隔に配置される6個の永久磁石14と、各永久磁石14の間に配設され、それぞれが磁極を形成する6個のコア部材16とを備える。各コア部材16はその略中央に、軸方向へ直線状に貫通形成された貫通孔22を備える。貫通孔22は、軸に直交する面において、円の一部を切除してなる弓形断面を有する。各貫通孔22には、その断面形状と略同一の弓形断面を有するロッド部材24が挿通される。ロッド部材24は、コア部材16の軸方向両端面から突出し、永久磁石14及びコア部材16の軸方向両端面に密接配置された端板26に固定される。各端板26は回転軸12に固定される。



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【特許請求の範囲】

【請求項1】 回転軸の周囲に略等間隔に配置され、周方向へ着磁される複数の永久磁石と、該永久磁石の各々を周方向へ挟持して該回転軸の周囲に配設され、それぞれが磁極を形成する複数のコア部材と、該永久磁石及び該コア部材の軸方向両端に配置され、該回転軸に固定される一対の端板と、該コア部材の各々を軸方向に貫通し、両端で該端板に固定される複数のロッド部材とを具備した同期電動機のロータにおいて、前記ロッド部材が、軸に直交する面において非円形断面を有し、前記コア部材が、軸に直交する面において該ロッド部材の断面形状と略同一の非円形断面を有して軸方向へ延びる貫通孔を備え、該貫通孔に該ロッド部材が挿通されることを特徴とする同期電動機のロータ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、同期電動機のロータに関する。

【0002】

【従来の技術】永久磁石界磁の同期電動機において、周方向へ着磁される複数の永久磁石と、それら永久磁石の間でそれぞれが磁極を形成する複数のコア部材とを、回転軸の周囲に交互に配設してなるロータが知られている。従来のこの種のロータでは、一般に各永久磁石は、その側面で隣接する各コア部材の側面に密接挟持され、各コア部材の半径方向外周部及び内周部にて側面に突設された外側係止部及び内側係止部によって、半径方向へ位置決めかつ固定支持される。他方、各コア部材は、略中心部に軸方向へ延びる貫通孔を備え、それぞれの貫通孔にロッド部材が挿入される。永久磁石及びコア部材の軸方向両端面には、それぞれ円板状の端板が密接配置され、各端板が回転軸に固定される。各端板には、各コア部材の貫通孔に整合する位置に開口が設けられ、コア部材の軸方向両端面から僅かに突出するロッド部材の両端部が、各端板の開口を貫通して各端板に固定される。このようにして、複数の永久磁石及び複数のコア部材は、遠心力等の外力に対してロータ構造内で固定的に支持される。

【0003】

【発明が解決しようとする課題】上記のロータでは、永久磁石及びコア部材の位置決め及び支持は、コア部材を貫通するロッド部材と端板との固定、及び端板と回転軸との固定によって得られる。しかしながら、永久磁石及びコア部材の成形時の寸法誤差により、永久磁石の側面とコア部材の側面、外側係止部、及び内側係止部との間に微小な隙間が形成されると、永久磁石の確実な支持が得られなくなるばかりか、一般にロッド部材が円形断面を有する丸棒からなるので、コア部材がロッド部材を中心に回転して正確な位置決めが得られない場合がある。このような不具合は、特に、電動機のコギングトルクを

低減するために、永久磁石とコア部材とを所定配置に組合わせてなるコア組体を軸方向へ重畳し、かつ各コア組体を所定角度だけ相対的に回転して固定したスキュー構造を有するロータにおいて顕著となる。スキュー構造のロータでは、一般にロッド部材の貫通孔はコア部材の中心からずれて形成されるので、コア部材の支点と重心とのずれにより偶力が生じるのである。

【0004】上記の不具合は、ロータの組立後にロータに含浸剤を含浸させて微小隙間を埋めることによって、ある程度防止できる。しかしながらこの方法では、組み立てたロータにおける含浸工程前のコア部材の回転偏移を防止することができない。また、含浸が不十分な場合は、永久磁石の着磁時及び電動機組込後の作動時にコア部材に半径方向外方へ及ぼされる磁気吸引力や遠心力等の外力によって、コア部材が回転してしまう場合がある。このようにコア部材が回転偏移を生じると、ステータとの間の空隙距離が変化し、電動機の作動精度に悪影響を及ぼす危惧がある。

【0005】本発明の目的は、回転軸の周囲に複数の永久磁石と複数のコア部材とを周方向へ交互に配設してなる同期電動機のロータにおいて、永久磁石及びコア部材を、厳格な成形精度を要求することなく確実に固定かつ位置決めでき、電動機の性能及び信頼性を向上することができるロータを提供することにある。

【0006】

【課題を解決するための手段】上記目的を達成するために、本発明は、回転軸の周囲に略等間隔に配置され、周方向へ着磁される複数の永久磁石と、永久磁石の各々を周方向へ挟持して回転軸の周囲に配設され、それぞれが磁極を形成する複数のコア部材と、永久磁石及びコア部材の軸方向両端に配置され、回転軸に固定される一対の端板と、コア部材の各々を軸方向に貫通し、両端で端板に固定される複数のロッド部材とを具備した同期電動機のロータにおいて、ロッド部材が、軸に直交する面において非円形断面を有し、コア部材が、軸に直交する面においてロッド部材の断面形状と略同一の非円形断面を有して軸方向へ延びる貫通孔を備え、この貫通孔にロッド部材が挿通されることを特徴とする同期電動機のロータを提供する。

【0007】

【作用】軸に直交する面において非円形断面を有する貫通孔とロッド部材との相互係合により、ロッド部材を中心としたコア部材の相対的回転動作が防止される。したがって、端板がロッド部材を固定支持することにより、ロータ内でコア部材が回転偏移に対して機械的に係止される。それにより、隣接する永久磁石とコア部材との間に隙間がある場合でも、ロッド部材を中心としたコア部材の回転は生じなくなり、永久磁石及びコア部材を所定位置に保持することができる。

【0008】

【実施例】以下、添付図面に示した好適な実施例に基づき、本発明をさらに詳細に説明する。図面を参照すると、図1は、本発明の第1実施例による同期電動機のロータ10を示す。ロータ10は、回転軸12と、回転軸12の周囲に略等間隔に配置され、周方向へ交互的に着磁される複数（図では6個）の永久磁石14と、永久磁石14の各々を周方向へ挟持して回転軸12の周囲に配設され、それぞれが磁極を形成する複数（図では6個）のコア部材16とを備える。永久磁石14は、略直方体形状を有し、その対向側面にて隣接する各コア部材16の側面に密接挟持される。コア部材16の両側面には、外周部にて周方向へ突出する外側係止部18と、内周部にて周方向へ突出する内側係止部20とが形成される。したがって各永久磁石14は、コア部材16の外側係止部18及び内側係止部20によって半径方向へ位置決めされ、かつ遠心力や磁気吸引力に抗して係止される。

【0009】各コア部材16はその略中心部に、軸方向すなわち回転軸12の軸線方向へ直線状に貫通形成された貫通孔22を備える。貫通孔22は、図1(b)に示すように、回転軸12の軸線に直交する面において、円の一部を切除してなる弓形断面を有する。各貫通孔22には、その断面形状と略同一の弓形断面を軸線に直交する面において有するロッド部材24が挿通される。ロッド部材24は、コア部材16の軸方向両端面から僅かに突出する長さを有する。永久磁石14及びコア部材16の軸方向両端面には、一對の円板状端板26が密接配置される。各端板26には、コア部材16の貫通孔22に整合する位置に、回転軸12の軸線に直交する面において貫通孔22の断面形状と略同一の弓形断面を有する開口28が形成される。各ロッド部材24は、コア部材16の軸方向両端面から突出するその両端で各端板26の開口28を貫通し、図示しない固定手段によって各端板26に固定される。各端板26は、焼嵌めや接着等によって回転軸12に固定される。

【0010】ロータ10の磁極を形成するコア部材16は、鉄損を抑制するために、珪素鋼板等の磁性材料からなる多数の薄板コア片を相互に積層かつ結合して形成されることが好ましい。このとき一般に薄板コア片は、磁性薄板材料から打ち抜き加工により形成されるので、上記のような非円形の貫通孔22も容易に形成することができる。

【0011】このようにロータ10においては、貫通孔22及びロッド部材24の断面形状を非円形の弓形としたので、ロッド部材24を端板26に固定することにより、いかなる場合にもロッド部材24を中心としたコア部材16の回転運動が防止される。したがって、成形時の寸法誤差によって、ロータ10の組立時に永久磁石14とコア部材16の外側係止部18及び内側係止部20との間に隙間が形成された場合でも、含浸剤の有無に関わらずコア部材16は所定位置に固定支持される。その

結果、永久磁石14の着磁時や電動機組込後の作動時に、磁気吸引力や遠心力等の外力が加わっても、コア部材16の回転偏移は生じない。なお、上記構造に従来通り含浸処理を施すことによって、永久磁石14の位置決め及び固定保持が確保される。

【0012】図2は、本発明の第2実施例によるロータ30を示す。ロータ30は、複数の永久磁石32と複数のコア部材34とを所定の交互配置に組合わせてなる2つのコア組体36を、所定角度だけ相対的に回転して軸方向へ重畳したスキュー構造を有する。コア組体36の各コア部材34に設けられた貫通孔38は、図2(b)に示すように、半径方向中心線から角度 α だけ同一方向に偏移した半径線上に中心を有する。ここで2つのコア組体36を、相互に裏返した状態、すなわち同一方向から見た端面形状が、図2(b)の形状と図2(b)とは角度 α の偏移方向が逆方向の形状とを呈する状態で軸方向に重畳し、共通のロッド部材40を両コア組体36のコア部材34の貫通孔38に挿通することにより、図2(a)のスキュー構造が得られる。両コア組体36の間には、長尺になりがちなロッド部材40の支持を補助するために、ロッド部材40を挿通する開口（図示せず）を備えた円板部材42が介在させられる。また、両コア組体36の軸方向外側端面には、図1のロータ10におけるものと略同一形状の端板44がそれぞれ密接配置される。貫通孔38、ロッド部材40、及び端板44の開口46の断面形状は、図1の実施例と同様に、回転軸12の軸線に直交する面において弓形である。ロータ30によれば、コア部材34が前述のように偶力を振り易い形状であるにも関わらず、ロッド部材40を中心としたコア部材34の回転が、非円形断面を有する貫通孔38、ロッド部材40、及び開口46の相互係合によって防止される。

【0013】図3は、本発明の第3実施例によるロータ48を示す。ロータ48は、図2のロータ30と同様のスキュー構造を有する。ロータ48の1つのコア組体50のコア部材52には、ロータ30における貫通孔38と同様に中心から所定角度 β だけ偏移した位置に、回転軸12の軸線に直交する面において正六角形断面を有する貫通孔54が形成される。一對の端板56にも、貫通孔54の断面形状と略同一の六角形断面を有する開口58が整合配置でそれらの貫通孔54及び開口58に、それらの断面形状と略同一の六角形断面を有するロッド部材60が挿入される。ロータ48においても、ロッド部材60を端板56の開口58に固定することにより、ロッド部材60を中心としたコア部材52の回転が防止される。

【0014】本発明は、上記各実施例の他に、種々の変形例を提供できることは言うまでもない。特に、コア部材の貫通孔及びロッド部材の断面形状は、上記実施例の形状に限定されるものでなく、円形以外の様々な形状が

可能である。ただし材料コストの観点から、ロッド部材として、JIS規格の下に市販されている四角棒や六角棒を使用することが有利である。また、端板の開口は、上記実施例のような貫通孔及びロッド部材の断面形状と略同一断面を有するものでなくてもよく、さらに開口自体が無くてもよい。その場合、周知の固定手段により、端板にロッド部材を固定できさえすればよいのである。

【0015】

【発明の効果】以上の説明から明らかなように、本発明は、ロッド部材の断面形状、及びロッド部材を挿通するコア部材の貫通孔の断面形状をいずれも非円形としたので、いかなる場合にもロッド部材を中心としたコア部材の相対的回転が防止される。その結果、永久磁石及びコア部材の厳格な成形精度を要求せずとも、ロッド部材を端板に固定することにより永久磁石及びコア部材をロータ内で正確に位置決めでき、かつ磁気吸引力や遠心力等の外力に抗して所定位置に確実に保持できる。したがって、本発明のロータを使用することにより電動機の性能及び作動信頼性を向上することができる。

【図面の簡単な説明】

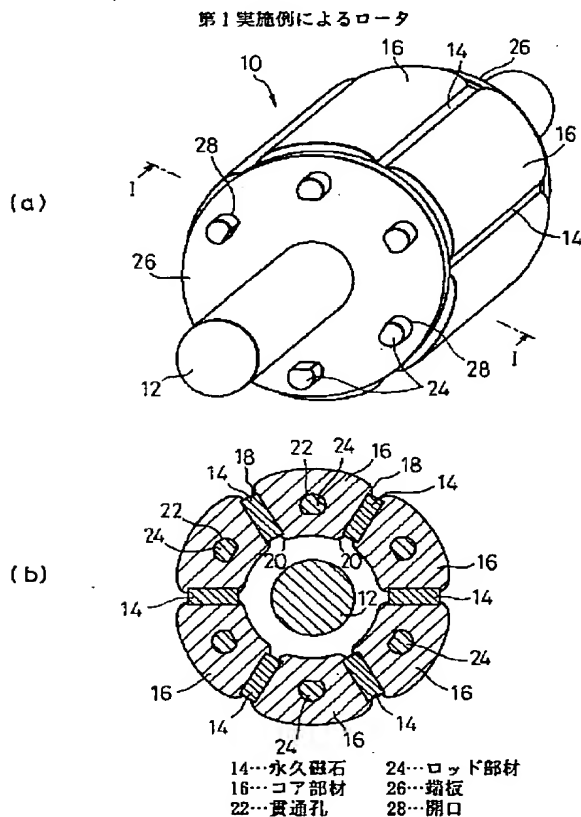
10

【符号の説明】

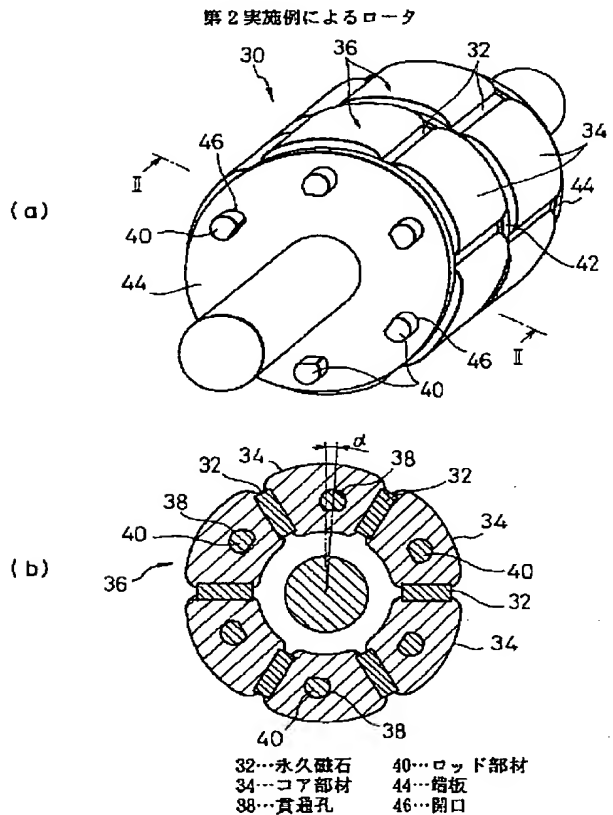
- 1 2…回転軸
- 1 4, 3 2…永久磁石
- 1 6, 3 4, 5 2…コア部材
- 1 8…外側係止部
- 2 0…内側係止部
- 2 2, 3 8, 5 4…貫通孔
- 2 4, 4 0, 6 0…ロッド部材
- 2 6, 4 4, 5 6…端板
- 2 8, 4 6, 5 8…開口

20

【図 1】

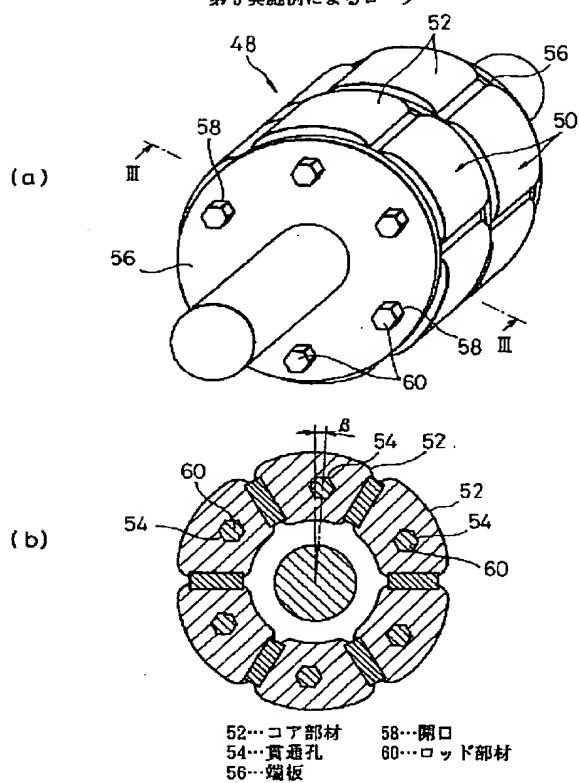


【図 2】



【図3】

第3実施例によるロータ



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